Magellan Weather Station™

User Manual

Columbia
Weather Systems

Magellan Weather Station™

User Manual

Version 2.03

Serial Number: _____

Date Purchased: _____

All specifications subject to change without notice.

Printed in U. S. A.

Columbia Weather Systems, Inc.

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Welcome!

Congratulations on your purchase of a Magellan Weather Station.

Please read this manual completely prior to installation.

Important Notice: Shipping Damage

BEFORE YOU READ ANY FURTHER, please inspect all system components for obvious shipping damage. The Magellan is a high precision instrument and can be damaged by rough handling. Your unit was packaged to minimize the possibility of damage in transit. Please save the shipping container for any future shipment of your Magellan sensor.

In the event your order arrives in damaged condition, it is important that the following steps be taken immediately. The title transfers automatically to you, the customer, once the material is entrusted to the transport company.

NOTE: DO NOT RETURN THE INSTRUMENT TO COLUMBIA WEATHER SYSTEMS until the following steps are completed. Failure to follow this request will jeopardize your claim.

1. Open the container and inspect the contents. Do not throw away the container or any damaged parts. Try to keep items in the same condition as originally received.
2. Notify the transport company immediately.
3. Request the transport company's representative inspect the shipment personally.
4. After inspection, request a Return Materials Authorization (RMA) from Columbia Weather Systems by calling (503) 629-0887.
5. Return approved items to us at the following address:

   Columbia Weather Systems, Inc.

   5285 NE Elam Young Parkway, Suite C100

   Hillsboro, OR 97124
6. After a repair evaluation, an estimate of the cost of repair will be sent to you.

ESD Protection

Electrostatic Discharge (ESD) can cause immediate or latent damage to electronic circuits. The Magellan is adequately protected against ESD for its intended use. However, it is possible to damage the product by delivering electrostatic discharges when touching, removing, or inserting any objects inside the equipment housing.

To avoid delivering high static voltages yourself:

1. Handle ESD sensitive components on a properly grounded and protected ESD workbench. When this is not possible, ground yourself with a wrist strap and a resistive connection cord to the equipment chassis before touching the boards. When neither of the above is possible, at least touch a conductive part of the equipment chassis with your other hand before touching the boards.
2. Always hold the boards by the edges and avoid touching the component contacts.

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SECTION 1: INTRODUCTION

The Magellan Weather Station

For cutting-edge weather monitoring in a harsh environment, the Magellan Weather Station combines a rugged multi-parameter weather sensor with an internal compass for automatic wind direction alignment.

The all-in-one Magellan sensor module integrates:

- A sonic anemometer for **wind speed** measurement
- Multi-element sensor for highly accurate and stable **temperature** readings
- Fast-response, capacitive relative **humidity** sensor
- State-of-the-art **barometric pressure** sensor
- Internal fluxgate **compass** for automatic alignment of **wind direction**

Weather monitoring options include WeatherMaster™ Software and the Weather MicroServer™ for internet-ready weather data and industrial protocols.

Magellan Weather Station Features

- Weather-protected sensor unit designed for maximum portability and utility
- Integrated sonic wind sensor
- Automatic self-alignment using internal fluxgate compass
- Rugged metal construction for rapid deployment in demanding applications
- No mechanical components means virtually no maintenance
- Low power consumption – ideal for battery or solar-powered installations

The Magellan sensor module has the following sensors:

- Sonic Wind speed and direction
- Air temperature
- Relative humidity
- Barometric pressure

Specifications

Wind Speed
Range: 0-134mph (0-60 m/s)
Accuracy: +/-0.5 m/s or 5% of reading
Resolution: 0.2 mph (0.1 m/s)
Units Available: knots, mph, km/hr, m/s

Wind Direction
Azimuth: 0-360°
Accuracy: ±5° at wind speed >2.2 m/s
Resolution: 1°
Units Available: ° Azimuth

Temperature
Range: -40 to +140°F (-40 to +60°C)
Accuracy: ±0.2°C (0 to 60°C)
±0.5°C (-40°C to 0°C)
Resolution: 0.1°C
Units Available: °F, °C

Barometric Pressure
Range: 17.50 to 32.50 InHg (600 to 1100 hPa)
Accuracy: ±0.5 hPa (At 25°C)
Resolution: 0.1 hPa
Units Available: Kpa, mbar, InHg

Relative Humidity
Range: 0 - 100%
Accuracy: ±3% (At 25°C)
Resolution: 1%
Units Available: %RH

Compass
Accuracy: ±2°
Resolution: 1°

Input Voltage

Sensor Input: 8 to 36 VDC

Current Consumption: 40mA typical@ 12VDC

Principles of Measurements

Temperature

The temperature sensor in the Magellan uses a precision triple-element thermistor. This provides highly accurate and stable temperature readings.

Humidity

The relative humidity sensor is a capacitive polymer sensor. The construction of the humidity sensor element provides excellent resistance to wetting, dust, dirt, oils, and common environmental chemicals.

Barometric Pressure

The barometric pressure sensor is a stable transducer using nano-technology, yielding a linear and repeatable sensor with low hysteresis. The piezoresistive pressure sensor module is mounted on a small electronic circuit board.

A microcontroller controls the operation of the sensor and the data interface. The microcontroller polls the pressure sensor module once per second for the barometric pressure and ambient temperature. The raw readings are temperature corrected by the microcontroller.

Wind Measurement

A unique folded-path, low-power sonic anemometer operates on the principle that the speed of the wind affects the time it takes for sound to travel from one point to a second point. If the sound is traveling in the direction of the wind, then the transit time is decreased. If the sound is traveling in a direction opposite the wind, then the transit time is increased.

Fluxgate Compass

The internal compass module is low power and compact. It employs a pair of magneto-inductive sensors which change inductance with varying magnetic field strengths, to sense the Earth's magnetic field.

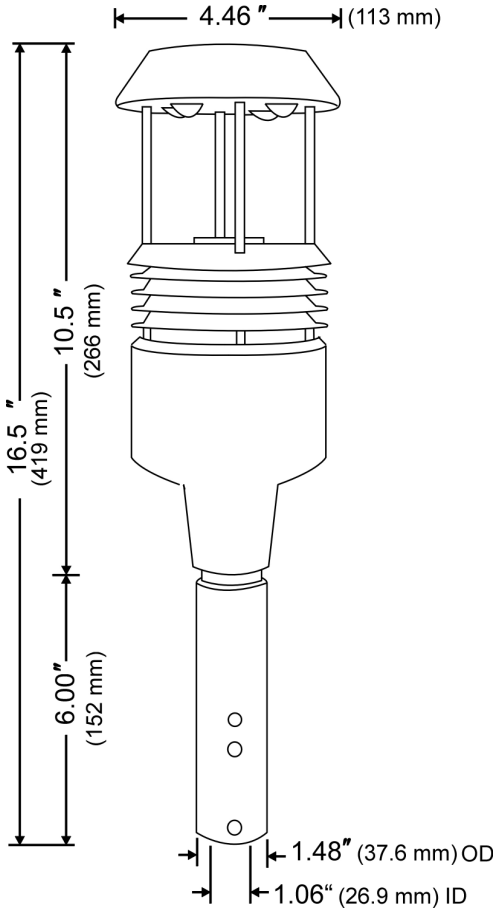
The microprocessor measures the output of the internal compass and then corrects wind direction data for the orientation of the sensor. The output of the wind direction is relative to magnetic North. A user programmable value of Magnetic Declination may be entered through terminal mode to enable output relative to True North rather than Magnetic North.

SECTION 2: PHYSICAL DESCRIPTION

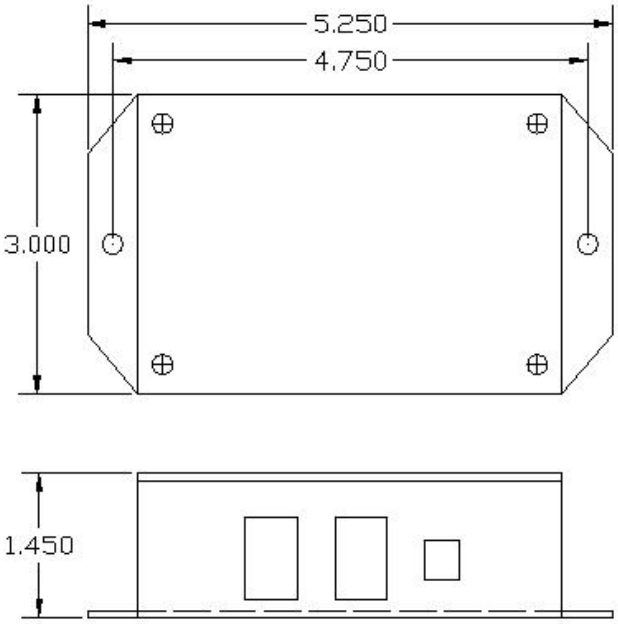
Magellan Sensor Transmitter

The Magellan Sensor Transmitter is an all-in-one sensor unit containing sonic wind speed and direction sensor, temperature sensor, relative humidity sensor, and barometric pressure sensor.

The temperature and relative humidity sensors are combined in a single module housed in a self-aspirating radiation shield.



Interface Module



The Interface Module is used to supply power to the sensor transmitter and to provide two RS-232 communication ports. The RS-232 ports can be connected to computers, transceivers, and other such devices.

The Interface Module has two LED indicators. The green LED is a power indicator and the red LED is a data indicator. In normal operation, the red LED will flash every second to indicate a data record being transmitted.

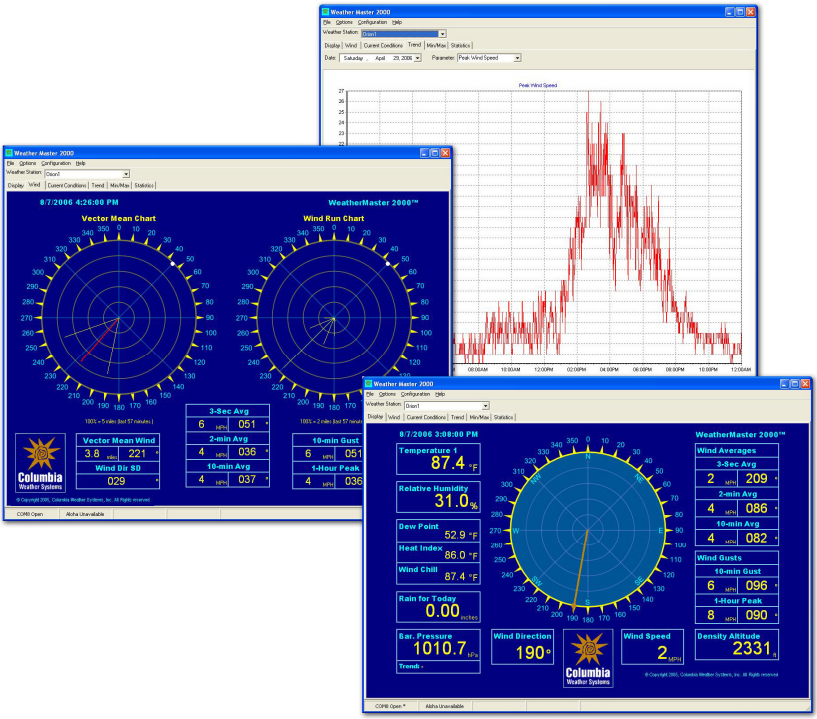
Surge/Lightning Protector

A nearby lightning strike may induce a high voltage surge which the internal suppressor of your weather instrument may not be able to withstand, causing significant damage to the weather station. Protect your weather station investment with the Surge/Lightning Protector. This compact transient overvoltage suppressor is designed for weather stations in areas with an elevated risk of lightning strikes such as the top of high buildings, or installations with cable lengths greater than 100 feet.

- Superior 3-stage surge protection
- Tolerates up to 10kA surge currents
- Both differential and common mode protection on each channel
- Filtering against HF and RF noise
- Two power channels and two data channels
- Environmental protection class IP66

Catalog Number: 8355
Includes adjustable mounting kit

WeatherMaster™ Software (Optional)



WeatherMaster is professional grade weather monitoring software. This software package is designed for specialized markets that require robust weather calculations, interoperability with computer models, and data interfaces to other industrial systems. WeatherMaster utilizes Microsoft Access database for easy data access and manipulation.

Please refer to the WeatherMaster user manual for installation and operation procedures

Weather Display Console (Optional)

Displays weather information • Designed to be viewed clearly from a distance • Industrial grade WVGA touchscreen.

Seven-inch, TFT color LCD panel with 800 x 480 pixel resolution.

Performs computations for wind chill, heat index and other calculated parameters • 200MHz ARM9 CPU

Serial or Ethernet connection: Connects directly to weather station with serial port or connects to a Weather MicroServer over a network utilizing an existing Ethernet infrastructure -- no extra wiring. The MicroServer configuration also allows for data from one weather station to be monitored from multiple display consoles at various locations.

Screens can be factory-customized to meet specialized market and industry requirements.

The Weather Display is also available in a 19” rack-mount chassis and a panel-mount configuration.

Please refer to the Weather Display Console user manual for more information.

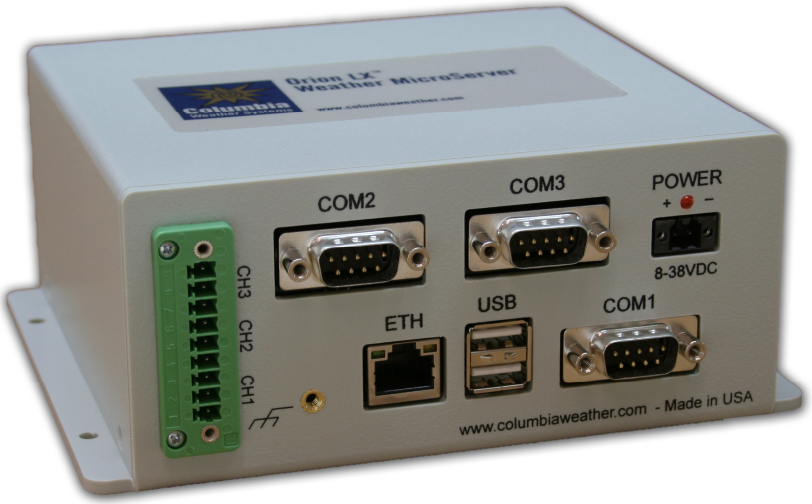
Weather MicroServer (Optional)

The Weather MicroServer uses a small computer board that runs an embedded Linux operating system.

The MicroServer has 32MB flash memory for operation and 8 GB SD card for data logging.

The Magellan transmitter connects to the MicroServer via COM1.

The MicroServer has two RS-232 COM ports and an Ethernet port.



The MicroServer offers the following:

- XML Weather Data
- FTP weather data in XML or CSV format
- Modbus/TCP, Modbus RTU (Serial RS-485) interfaces
- SNMP, BACnet, DNP3 interfaces
- Weather Underground & Anything Weather interface
- CWOP interface
- Years' worth of data logging at 1-minute interval
- Interface to optional visibility, solar radiation sensors, and temperature sensors

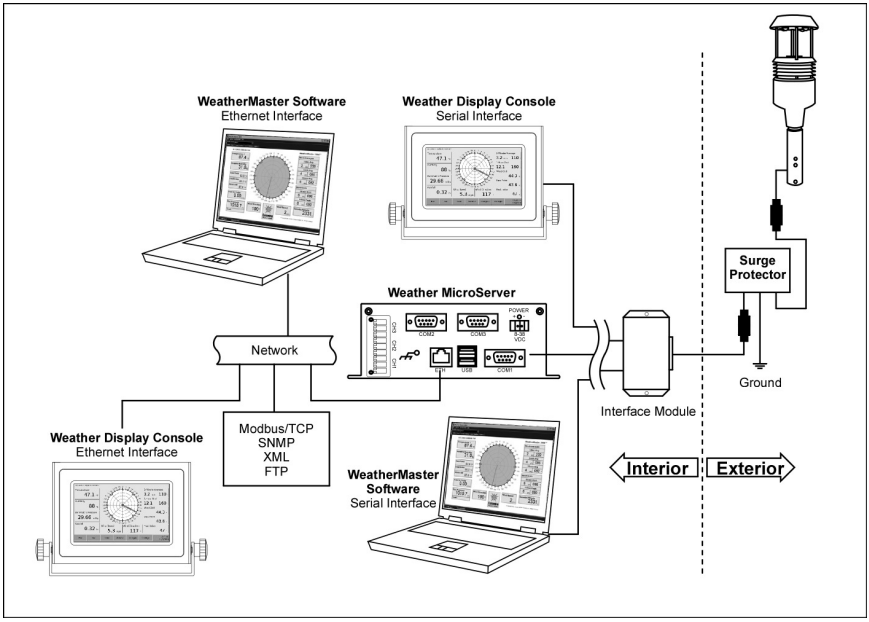
Please refer to the Weather MicroServer user manual for more information.

SECTION 3: FIXED MOUNT INSTALLATION

Fixed Mount System Configurations

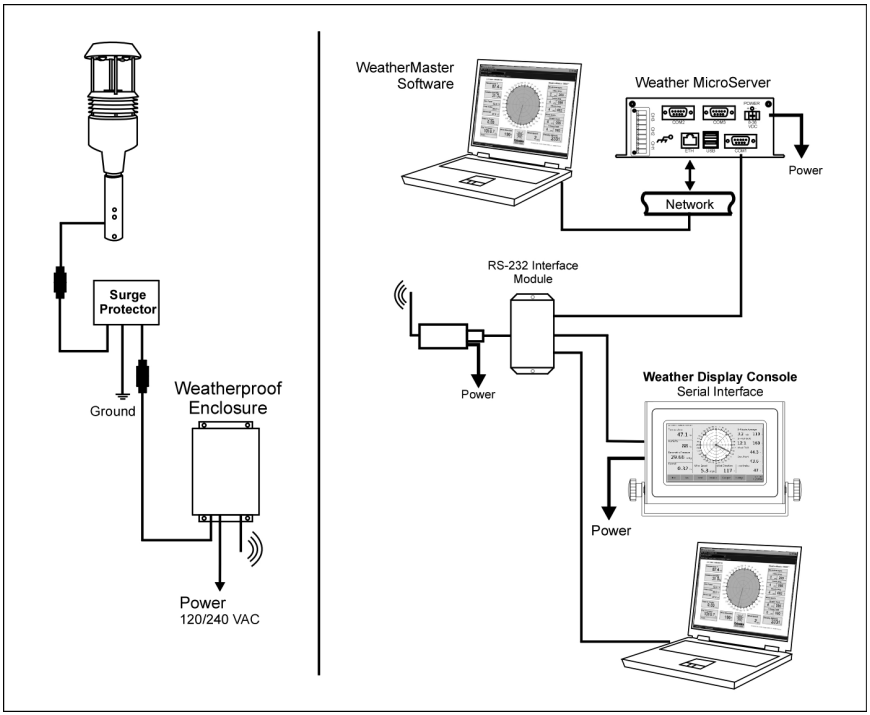
The Magellan Fixed Mount Weather Station can be installed in multiple configurations depending on communication options, power availability and viewing options.

Cabled System:



Wireless System with Weatherproof Enclosure:

The following is an example of a wireless configuration.



Installation Overview

Unpacking the System

Installing the Mast

Installing the Sensor Transmitter

Installing the Surge Arrestor

Installing the Interface Module

Connecting the Sensor Transmitter to the Interface Module

Connecting to MicroServer, Weather Display and Computer (refer to Section 3: Fixed Mount Installation)

Unpacking the Unit

Unpack the Magellan weather station and verify that all parts are included.

1. Standard system includes:
    - ❑ Magellan Sensor Transmitter
    - ❑ 50 ft sensor cable + additional cable length if ordered
    - ❑ Interface Module
    - ❑ (2) 3-position terminal blocks
    - ❑ Interface module power supply
    - ❑ User Manual
    - ❑ 7-foot RS-232 cable + additional cable length if ordered
2. Weather Display Console (**Optional**)
    - ❑ Display Console
    - ❑ Power supply
    - ❑ 6-foot RS-232 cable + additional cable length if ordered
    - ❑ User manual
3. WeatherMaster software and user manual (**Optional**)
4. Weather MicroServer (**Optional**)
    - ❑ MicroServer
    - ❑ Power supply
    - ❑ 6-foot Ethernet cable

- ❑ User manual

Inspect all system components for obvious shipping damage (Refer to “Important Notice: Shipping Damage” in case of damage).

NOTE: Save the shipping carton and packing material in case the unit needs to be returned to the factory. If the system does not operate or calibrate properly, see **Maintenance** and **Troubleshooting** sections, for further instructions.

Installing the Mast

There are three acceptable methods for mounting the mast to a roof or building structure: Sloped roof mounting, flat roof mounting or wall mounting. See **Optional Sensor Mounting Hardware** for more information.

Location

Do not attach the sensor transmitter to a radio transmitting mast or tower.

Select a mounting location that will allow the sensor cable to be routed away from other data cables to avoid interference. Do not mount sensors close to power lines. For normal roof mounting, the recommended minimum distance from power lines is 25 ft. (8 m). Use extreme caution when working close to power lines.

Mounting Method

Choose the appropriate mounting method for the installation and obtain any necessary mounting hardware. Refer to Optional Sensor Mounting Hardware section for information on optional sensor mounting hardware and accessories which are available from the factory.

If the mounting hardware is not obtained from the factory, be certain to use metal parts which are plated or galvanized to assure maximum longevity.

Secure the mast to the roof, using guy wires with sufficient tensile strength or to building wall using a wall-mount hardware kit.

Routing Cable

Use plastic tie wraps to secure the cable to mast, particularly at the mast base. Tighten the tie wraps securely and clip off any excess length with a wire cutter tool.

Once the Magellan sensor transmitter has been installed route the cable back to the Interface Module or weatherproof enclosure.

CAUTION: There may be electric wires in the wall. When routing cable through walls, we recommend that you shut off the electricity in the room(s) where you are drilling.

Any mast or tower should always be properly earth grounded to minimize electrical storm damage. The use of a properly grounded metal mast or tower, however, does not insure protection from electrostatic discharge. These items could become electrically charged resulting in damage to the sensors and/or console. This could damage the system in the event of an electrical storm.

Note: If the standard 50 ft. cable provided with the sensor transmitter is not long enough, it may be extended by splicing on an appropriate length of 22-gauge, stranded, seven conductor shielded cable with the same color code. When cutting and splicing, insure good contacts, proper color coding of the terminal leads, and a good seal. (A good solder splice, and water proof insulation are essential; merely twisting the respective wires together is not adequate.) Additional cable (Catalog No. 81547) is available from the factory.

Installing the Magellan Sensor Transmitter

Site Selection:

Finding a suitable site for the sensor transmitter is important in obtaining representative ambient measurements.

The sensor transmitter should be installed in a location that is free from turbulence caused by nearby objects, such as trees or buildings.

WARNING: To protect personnel (and the device), a lightning rod should be installed with the tip at least 40 inches (one meter) above the sensor transmitter. The rod must be properly grounded, compliant with all local applicable safety regulations.

North Alignment

The Magellan sensor has a built-in electronic compass for North alignment.

The Magnetic Declination has been entered into the sensor for your area. To change the magnetic declination, please see the Operation section.

Installing the Mounting Adapter

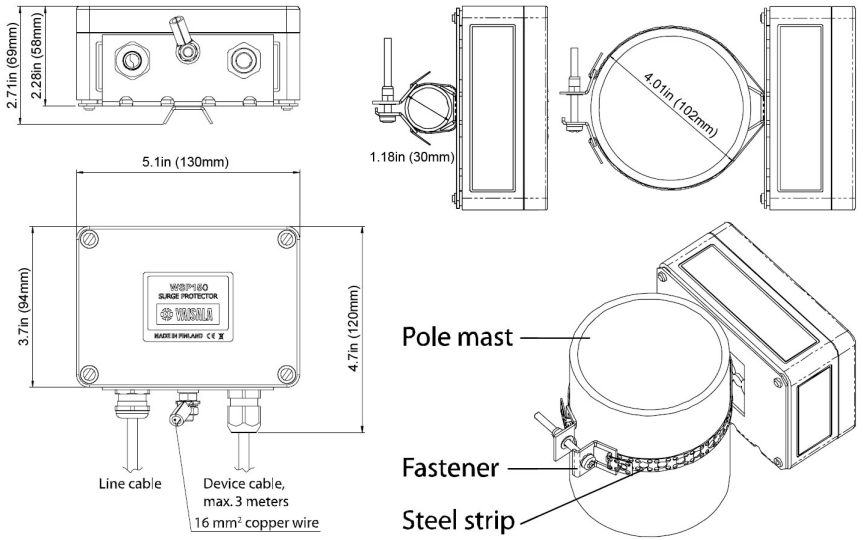
Follow the procedure below to connect the Magellan Sensor to the mounting adapter:

1. Feed the sensor cable through the mounting adapter.

2. Plug the metal cable connector into the base of the Magellan Sensor and tighten.

3. Insert the sensor onto the mounting adapter and tighten the two slotted base set screws.

Installing the Surge Arrestor



1. Attach the unit to the mast close to the weather sensor with the adjustable mounting clamp, see figure above.

2. Slide the steel strip beneath the latch on the back of the enclosure.

3. Wrap the steel strip around the pole mast. You may shorten the strip to a suitable length.

4. Loosen the fastener by backing up the screw half way.

5. Attach the steel strip ends to the fastener by latching the fastener to a hole on the strip and folding it over.

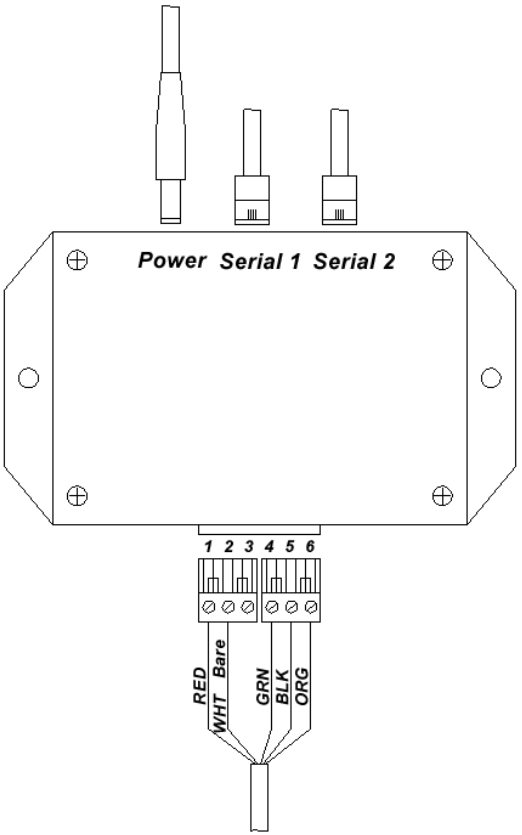
6. Tighten the fastener's screw in order to secure the unit to the pole.

7. Ground the unit using an AWG 6 (16 mm^2) copper wire.

Connecting the Sensor Transmitter to the Interface Module

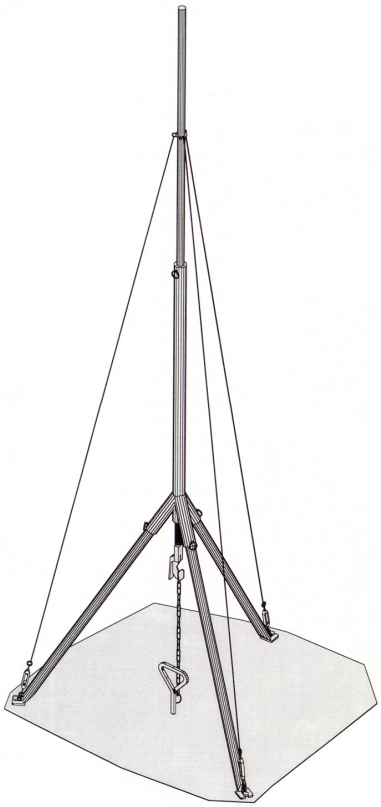
Using a #1 Straight Slot screwdriver, attach the wires from the end of the sensor cable to the terminal block screws on the Interface Module as follows:

Terminal Number	Signal	Color
1	+12 V	RED
2	Ground	White and Bare
3	No Connection	
4	Signal Ground	Green
5	RX	Black
6	TX	Orange



Optional Sensor Mounting Hardware

Telescoping Tripod and Tiedown Kit

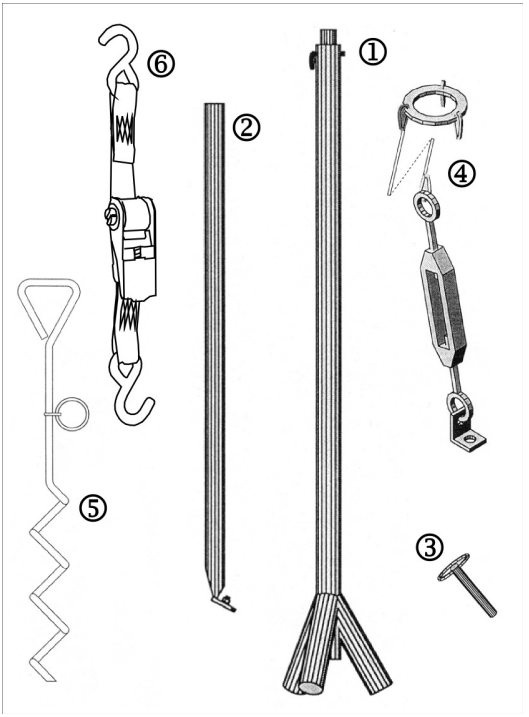


The tripod is designed to provide up to 10 feet of stable, secure support for your meteorological sensors.

Constructed from welded anodized aluminum for appearance and longevity, the 15-pound tripod can easily support up to 60 pounds of equipment. An optional tie-down kit allows for additional security in high-wind areas.

To install, insert the legs into the main body and secure with stainless steel retainer pins. Extend the mast to the desired height and insert another retainer pin. Install the guy wires to complete the set-up.

Tripod Parts List:



Description	Ref.	Qty.
Body/Mast Assembly	1	1
Legs	2	3
Retainer Pins	3	4
Guy Wire Ring with 3 Wires and Turnbuckles	4	1
Anchor Screw with Chain	5	1
Clamp with Strap	6	1

Specifications

Capacity: Supports up to 60 lbs.

Shipping Weight: 17 lbs

Shipping Box Dimensions: 71" x 9" x 9"

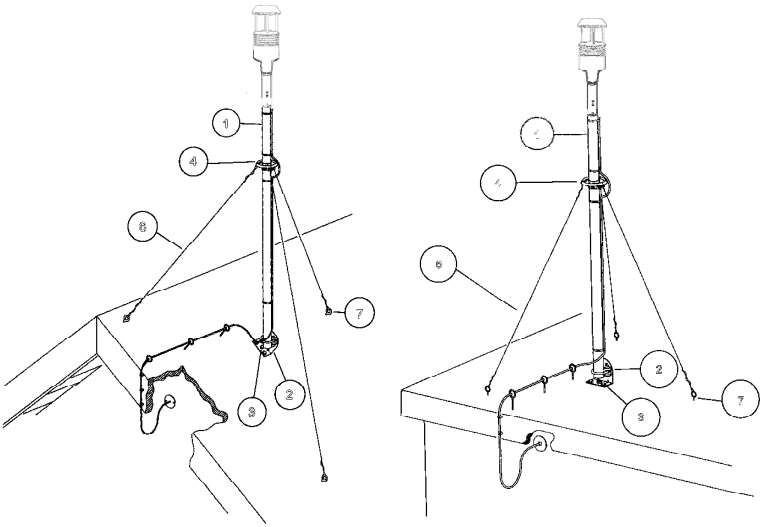
Tripod and Tiedown Kit Part Number: 88019

Sensor Mast

10-foot steel mast available for use with Roof Mount Hardware Kit (Part No. 88002) or Wall Mount Kit (Part No.88003).

Roof Mounting

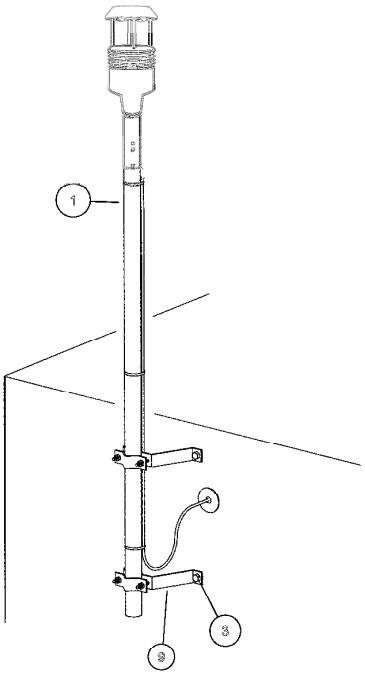
The Roof Mounting Kit (Cat. No. 88002) is suitable for both a slanted and flat roof installation. The figure and table below illustrates and describes the individual parts.



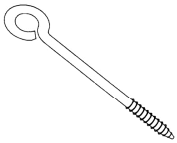
Description	Ref.	Qty.	Part No.
Steel mast, 10 ft.	1	1	88005
Universal Mast Anchor	2	1	88010
Lag Screw, Roof Mast Mount 1/4" x 2 1/4" (for comp. roofs)	3	4	88030
Guy Wire Clamp, 1/8"	4	1	88070
Steel Guy Wire, Galvanized	6	50ft.	88080
Eye Bolt Wood Screws, 1/4" x 3"	7	4	88090
Turnbuckles, 6" open x 4" closed	(not shown)	3	88100

Wall Mounting

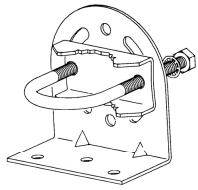
The figure and table below illustrates and describes the individual parts in the Wall Mounting Kit (Part No. 88003). Individual parts are also available.



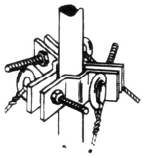
Description	Ref.	Qty.	Part No.
Mast, 10 ft.	1	1	88005
4" Wall Mount Bracket	9	2	88120
Lag Screw	3	4	88030



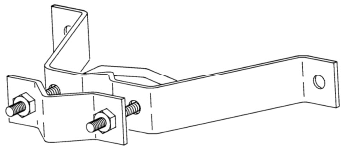
EYE BOLT SCREW



UNIVERSAL MAST ANCHOR



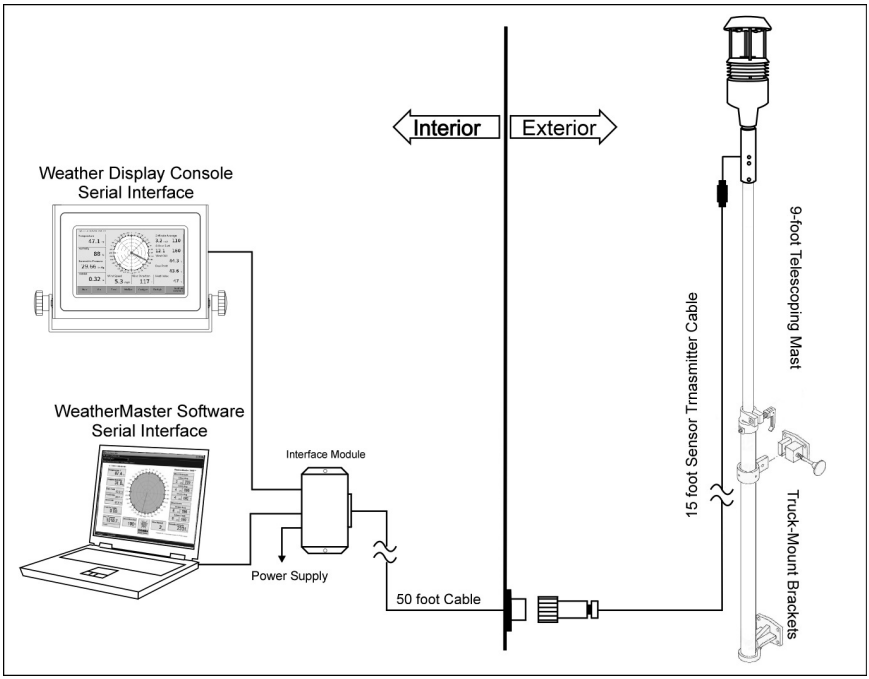
GUY WIRE CLAMP



4” WALL MOUNT BRACKET

SECTION 4: VEHICLE MOUNT INSTALLATION

Vehicle Mount System Configurations



Installation Overview

Unpacking the Unit

Installing the telescoping mast and truck-mount brackets

Installing the vehicle mount connector and routing cable

Installing the Interface Module

Installing and connecting the Weather Display Console and Computer Software

Installing the Magellan sensor transmitter and mounting adapter

Unpacking the Unit

Unpack the Magellan weather station and verify that all parts are included.

1. Standard system includes:

- ❑ Magellan Sensor Transmitter
- ❑ 15 ft external sensor cable and male sensor connector (plus additional cable lengths, if ordered)
- ❑ 50 ft internal cable with vehicle mount female sensor connector (plus additional cable lengths, if ordered) and all-weather connector cap
- ❑ Interface Module with power supply
- ❑ (2) 3-positon terminal block connectors
- ❑ 6-foot RS-232 cable (plus additional cable lengths, if ordered)
- ❑ 9 ft telescoping mast with vehicle-mount brackets
- ❑ Mast extension sleeve adapter
- ❑ User Manual

2. Weather Display Console (**Optional**)

- ❑ Display Console
- ❑ Power supply
- ❑ 6-foot RS-232 cable (plus additional cable lengths, if ordered)
- ❑ User Manual

3. WeatherMaster Software, with User Manual (**Optional**)

Inspect all system components for obvious shipping damage (Refer to “Important Notice: Shipping Damage” in case of damage).

Save the shipping carton and packing material in case the unit needs to be returned to the factory. If the system does not operate or calibrate properly, see **Maintenance** and **Troubleshooting** sections, for further instructions.

Installing the telescoping mast and vehicle-mount brackets

1. Select a location on the vehicle where the Magellan sensor mast will be installed.
2. Three mounting brackets are included with the mast. The mounting base plate and a spring-loaded securing mounting bracket will be permanently mounted to the vehicle for quick and easy set up. The third bracket is attached to the mast and mates with a slot on the spring-loaded mounting bracket. This bracket may be loosened and re-positioned on the mast to fit the installation scheme and mounting bracket positioning. A spacer for the spring-loaded bracket is provided to insure that the mast is 90° vertical.
3. Ensure the vehicle-mount sensor connector is in close proximity to the mast's mounting bracket location (refer to the vehicle-mount sensor connector section below). Mark and drill the appropriate mounting bracket holes. Be sure to allow for sufficient structural backing, to adequately support the mast and sensor.
4. External sensor cabling is intended to hang freely along the side of the mast. This assures the mast's easy extension and retraction without pinching, crimping, or cutting the sensor cable. Users may tie-wrap the cable to the lower portion of the mast. The external sensor cable has a male connector that couples to the vehicle-mount female connector on the side of the vehicle.
5. To extend the mast, locate the large textured locking ring at the top of the nested mast. This ring loosens and tightens the mast extension. A counter-clockwise rotation loosens the ring and allows the mast to be fully extended. Clockwise ring rotation tightens the extension in place.

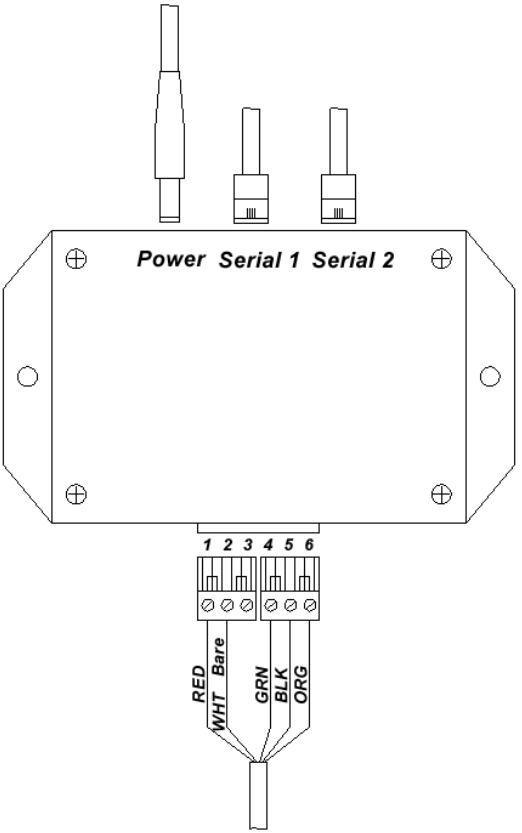
Installing the vehicle mount sensor connector and routing cable

1. To install the female vehicle-mount sensor connector, drill a ¾" hole in close proximity to the sensor mast mounting bracket installation. A recommended location is near the mast's lower base bracket.
2. Drill four small pilot holes for the mounting screws.
3. Run 50-ft cable through the hole and route to the Interface Module location.
4. Connect the cable to the 3-position connectors, as listed in the chart below.
5. Affix the connector with mounting screws on the external side of the vehicle and ensure the associated all-weather connector cap is securely attached.

Installing the Interface Module

Using a #1 Straight Slot screwdriver, attach the wires from the end of the sensor cable to the terminal block screws on the Interface Module as follows:

Terminal Number	Signal	Color
1	+12 V	RED
2	Ground	White and Bare
3	No Connection	
4	Signal Ground	Green
5	RX	Black
6	TX	Orange



Connecting the Weather Display Console and Computer

Connect the Weather Display Console to the Interface Module using the RJ-11 cable. The Display Console can be connected to either serial port 1 or 2.

Connect the Interface Module to the computer using the RJ-11 and DB-9 connector (RS-232 Interface). The computer can be connected to either serial port 1 or 2. On the computer end, the DB-9 connector is plugged into the computer serial port (normally COM port 1). If the computer does not have a serial port, then a USB to Serial Port converter is required.

Installing the sensor transmitter and North Orientation

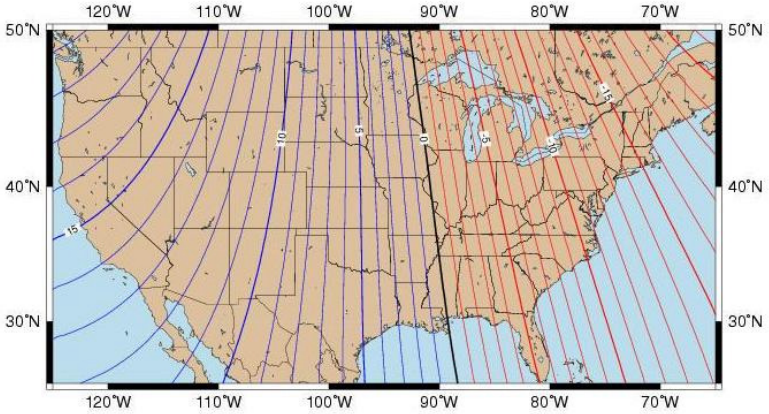
North Alignment

The Magellan sensor has a built-in electronic compass for North alignment.

The Magnetic Declination has been entered in the sensor for your area. To change the magnetic declination, please see the Operation section.

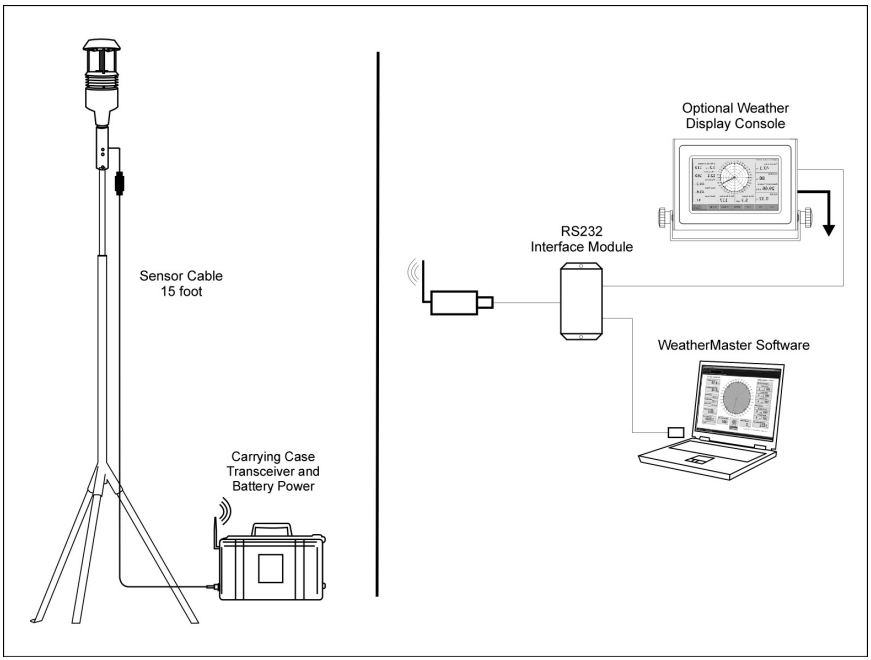
Wind direction can refer to either **Magnetic North**, which is read with a magnetic compass, or **True North**, which uses the earth's geographic meridians. The magnetic declination is the difference in degrees between the true north and magnetic north.

Magnetic Declination for the U.S.



SECTION 5: PORTABLE INSTALLATION

Magellan Portable with WeatherMaster Software:



Unpacking the Unit

Standard system includes:

1. System Carrying Case
    - ❑ Magellan Sensor Transmitter
    - ❑ 15 ft sensor cable
    - ❑ 2.4 GHz Transceiver and antenna
    - ❑ (2) 12 volts Batteries
    - ❑ Battery Charger
    - ❑ User Manual
2. Tripod
    - ❑ Guy wire and collar
    - ❑ Tie-down kit
    - ❑ Canvas tripod bag
3. Receiving Transceiver
    - ❑ 2.4 GHz Transceiver and antenna
    - ❑ 6-foot RS-232 Transceiver cable
    - ❑ Interface Module (**Optional**)
4. Weather Display Console (**Optiona**l)
    - ❑ Display console
    - ❑ Power supply
    - ❑ 6-foot RS-232 cable
    - ❑ User manual
5. WeatherMaster software (**Optional**)
    - ❑ Software CD
    - ❑ 6-foot computer cable
    - ❑ User manual
6. Weather MicroServer (**Optiona**l)
    - ❑ MicroServer
    - ❑ 7-foot Ethernet cable
    - ❑ Power supply
    - ❑ User manual

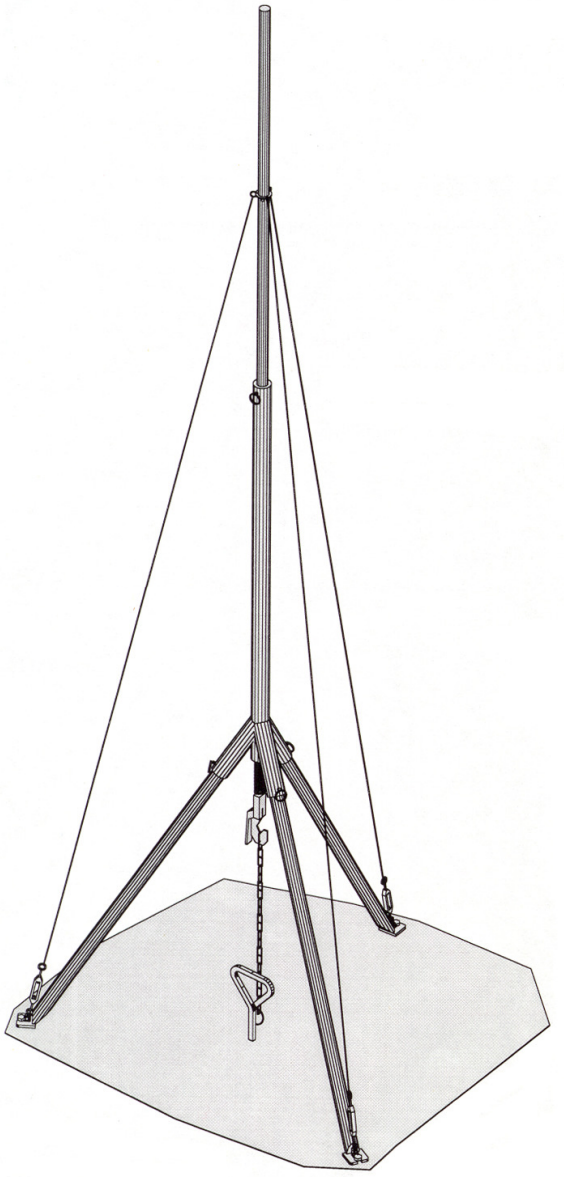
Inspect all system components for obvious shipping damage (Refer to “Important Notice: Shipping Damage” in case of damage).

Save the shipping carton and packing material in case the unit needs to be returned to the factory.

Magellan Portable Carrying Case

The Magellan carrying case stores the sensor head, batteries, transceivers and other accessories. It serves as a weatherproof enclosure with a wiring harness, antenna, and connection to the sensor head for power and communication via the wireless transceiver.

Telescoping Tripod and Tiedown Kit



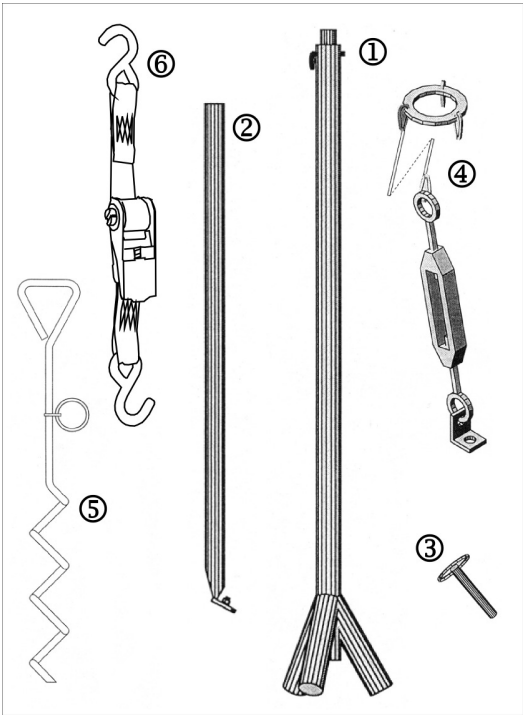
The tripod is designed to provide up to 10 feet of stable, secure support for your meteorological sensors.

Constructed from welded anodized aluminum for appearance and longevity, the 15-pound tripod can easily support up to 60 pounds of

equipment. An optional tie-down kit allows for additional security in high-wind areas.

To install, insert the legs into the main body secure with stainless steel retainer pins. Extend the mast to the desired height and insert another retainer pin. Install the guy wires to complete the set-up.

Tripod Parts List:



Description	Ref.	Qty.
Body/Mast Assembly	1	1
Legs	2	3
Retainer Pins	3	4
Guy Wire Ring with 3 Wires and Turnbuckles	4	1
Anchor Screw with Chain	5	1
Clamp with Strap	6	1

Specifications

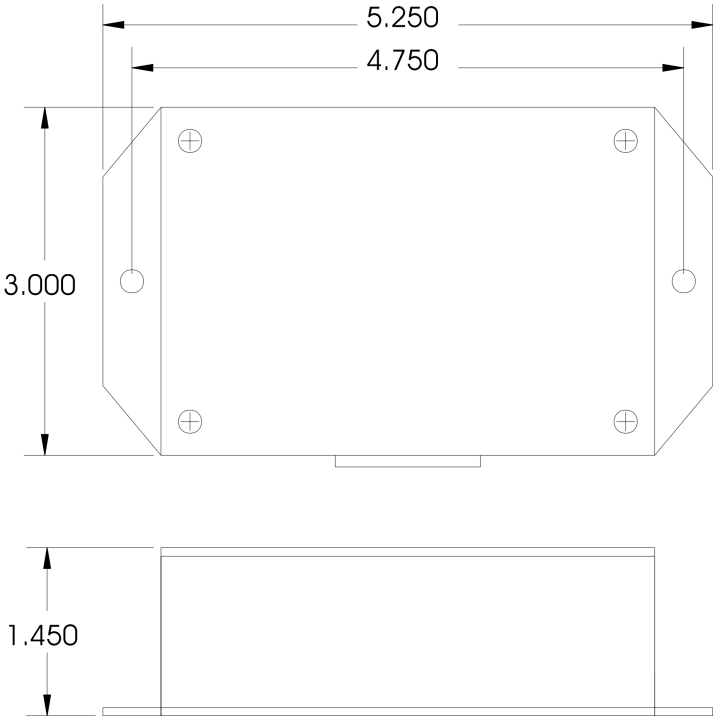
Capacity: Supports up to 60 lbs.

Shipping Weight: 17 lbs

Shipping Box Dimensions: 71" x 9" x 9"

Tripod and Tiedown Kit Part Number: 88019

RS-232 Interface Module



The RS-232 Interface Module connects up to four devices to the wireless transceiver, such as computers, display consoles and other such devices.

Set Up Instructions

Site Selection:

1. Upon arrival at the deployment site, determine a suitable location where the Magellan mast may be set up away from physical obstructions and heavy foot traffic. Because of the wireless transceivers, the telescoping tripod and sensors may be located as far as 1-mile (Line of Sight - LOS) away from where the weather data is viewed.
2. Site location should be away from trees, buildings or other obstructions that will alter accurate wind direction and speed-readings.
3. Screw the grounding/tie-down auger into the ground at the center of the placement until the auger portion is adequately secured.
4. If the site selection is on blacktop/pavement, use a 6” nail spike or Rebar driven into the surface at a 45° angle. This sufficiently secures the mast during operations.

Mast Set Up and Sensor Alignment:

1. Remove tripod components from the bag. Stand the tripod up (without legs) so the sensor head may be attached to the mast.
2. Attach the Sensor Head to the mast.
3. Attach sensor cable by connecting the 8-pin waterproof male connector/sensor cable to the one-foot female sensor pig-tail waterproof connector.
4. Holding the tripod vertical, place tripod legs in their respective slots, one leg at a time. Once the first leg is in, balance the tripod until the other legs are inserted and the tripod is free standing.
5. With all legs in place, insert the leg locking pins. The tripod may now be picked up and moved over the grounding stake.
6. Secure the tripod to the grounding stake using the clamp strap. Ensure the strap is tight enough to keep the tripod in-place during high winds.
7. Extend the mast to its fullest height and insert the locking pin.
8. If the guy wire kit is used, remove the sensor and mounting adapter prior to mast set up and slide the guy wire ring collar onto the mast extension, then reinstall the sensor. Anchor the end of each guy wire to the corresponding tripod foot using the wing nuts. Extend the mast fully and adjust the guy wires using the turnbuckles to tighten the guy wires evenly.

Transportation Case and Sensor Plug-In

1. Place the Magellan transportation case at the foot of the tripod.
2. Attach the 8-inch wireless antenna to the antenna cable on the outside of the case.
3. Plug the 8-pin Female Sensor Cable to the 8-pin male connector on the outside of the case.
4. Ensure the red/black power cord connectors are connected to their respective battery terminals inside the case.
5. Latch and seal the case to the internal components from the weather elements.

Battery Power System

1. The Magellan comes with a Battery Power System that consists of two 12VDC, 7.5AH batteries and a 12-Volt battery charger. One battery will continuously operate the Magellan for approximately 60 hours. One battery is intended to be charging while the other is in operation.
2. Swap batteries, as necessary to continue weather station operations.

Operation

Once the Mast is set up, with the Sensor Head attached, plug the red/black power terminals to the corresponding battery terminals. The Magellan will automatically sense and transmit weather data via wireless transceiver.

1. Transceiver Power/Connectivity/Transmission:
    a) Check for the red power light
    b) Check for the steady green connectivity light
    c) Check for the one-second green pulsing/blinking transmission light
2. Once the transceiver lights are all operational, data is being transmitted. If the green transmission light is not blinking once per second, data is not being transmitted. Re-check the RS-232, power, and antenna connections.

Monitoring

The data transmitted from the remote sensor can be monitored using the Weather Display console, computer weather software, and/or Weather MicroServer.

Connect the wireless transceiver to the appropriate device. Please refer to the system diagrams provided with the system.

SECTION 6: OPERATION

Magellan Sensor Transmitter Interface

The Magellan sensor communicates via a serial interface at the following settings:

Baud rate: 9600

Data bits: 8

Stop bits: 1

Parity: None

Flow control: None

On power up, the Magellan sensor automatically outputs a string of data containing the current values of all parameters once per second.

To activate terminal mode, hit the <Enter> key three times within a two second period.

Successful entry into terminal mode will return the prompt:

Command (HE for Help, QU to Quit):

Magnetic Declination

The flux compass in the Magellan sensor provides wind direction to Magnetic North. The sensor firmware allows the setting of a declination angle to correct the wind direction output to True North. Once the declination angle is set in the sensor, it is stored permanently in non-volatile memory. The declination angle must be reset only if the system is used in a different geographical location separated by many miles from the original location.

Please note that the magnetic declination is set at the factory per system, based on the shipping destination.

To reset the magnetic declination:

1. Determine the Correct Declination

Visit the following web site for help in determining the correct declination for your site:

http://www.ngdc.noaa.gov/geomag/declination.shtml

Under Declination click “Calculate”

Under Lookup Latitude/ Longitude enter your zip code and click “Get & Add Lat / Lon” or manually enter latitude and longitude.

Under Calculate Declination click “Calculate”

The declination will be displayed in degrees (º) and minutes ('), e.g. 16º 27'. Divide the minutes by 60 to get decimal remainder of degrees, e.g. 27 minutes = 0.45 degrees. The declination will be rounded up from 16.45 to 16.5 to conform to the data entry format of one decimal place.

2. Read or Set the Magnetic Declination

With the Magellan sensor connected through the Interface Module to a computer, start HyperTerminal program. (This program can be accessed through the Windows Start button - All Programs - Accessories - Communications.) The automatic weather data output should start streaming.

Activate Terminal mode by pressing the Enter button three times in quick succession (within a 2-second period). You should receive the following prompt: Command (HE for Help, QU to Quit):

Use the MD command as shown below to read or set the magnetic declination:

Command	**Result**
MD<Enter>	Report Magnetic Declination setting
MDxx.x<Enter>	Set declination to xx.x degrees

Note: West declination values are entered and reported as negative values.

In the example above, the declination is 16° 27' East. The value converted to decimal is 16.45. If entered as such, it will be rounded up to 16.5.

Enter the following commands:

MD16.5[Enter]

QU[Enter] to quit.

Y[Enter] to save.

Parameter Units

The Magellan sensor is set to specific units that must not be changed. The MicroServer assumes these units and if changed, the MicroServer and WeatherMaster software will report incorrect parameter values.

Wind speed: m/s

Temperature: ℃

Relative Humidity: %RH

Barometric Pressure: milliBar

SECTION 7: CALIBRATION

Factory Calibration

Send the device to Columbia Weather Systems, Inc. for calibration and adjustment, see Section 9: USER SUPPORT INFORMATION for more information.

Temperature and Pressure Reading Adjustments

Even though the temperature sensor is calibrated at the factory to ±0.5° F and requires no further calibration, and similarly the pressure sensor is calibrated to ±0.015 inches Hg, the sensors reading can be adjusted using WeatherMaster software or the Weather Display console. Please refer to their user manual for more information.

SECTION 8: MAINTENANCE

Because the sensor has no moving parts to wear out, periodic maintenance is not required.

The only user repairable part is the Temperature/Relative Humidity Sensor Module (T/RH Module) located inside the multi-plate shield.

To order the T/RH Module please contact Columbia Weather Systems for more information.

SECTION 9: USER SUPPORT INFORMATION

This section consists of the following items:

1. One-Year Limited Warranty: Please read this document carefully.
2. Return for Repair Procedure: This procedure is for your convenience in the event you must return your Magellan for repair or replacement. Follow the packing instructions carefully to protect your instrument in transit.

Limited Warranty

Columbia Weather Systems, Inc. (CWS), warrants the Magellan Weather Station to be free from defects in materials and/or workmanship when operated in accordance with the manufacturer's operating instructions, for one (1) years from date of purchase, subject to the provisions contained herein. CWS warranty shall extend to the original purchaser only and shall be limited to factory repair or replacement of defective parts.

EXCLUSIONS

Certain parts are not manufactured by CWS (i.e., certain purchased options, etc.) and are therefore not covered by this warranty. These parts may be covered by warranties issued by their respective manufacturers and although CWS will not warrant these parts, CWS will act as agent for the administration of any such independent warranties during the term of this warranty. This warranty does not cover normal maintenance, damage resulting from improper use or repair, or abuse by the operator. Damage caused by lightning or other electrical discharge is specifically excluded. This warranty extends only to repair or replacement, and shall in no event extend to consequential damages. In the event of operator repair or replacement, this warranty shall cover neither the advisability of the repair undertaken, nor the sufficiency of the repair itself.

THIS DOCUMENT REFLECTS THE ENTIRE AND EXCLUSIVE UNDERSTANDING OF THE PARTIES, AND EXCEPT AS OTHERWISE PROVIDED HEREIN, ALL OTHER WARRANTIES, EXPRESS OR IMPLIED, PARTICULARLY THE WARRANTIES OF MERCHANT ABILITY AND/OR FITNESS FOR A PARTICULAR PURPOSE ARE EXCLUDED.

This warranty gives you specific legal rights, and you may also have other rights which vary from state to state.

Return for Repair Procedure

1. In the event of defects or damage to your unit, first call the Service Department Monday through Friday, 8:30 am to 4:00 pm PST, (503) 629-0887 to determine the advisability of factory repair. The Service Department will issue an RMA number (Return Merchandise Authorization) to help us identify the package when received. Please write that number on the outside of the box.

2. In the event factory service is required, return your Magellan Weather Station as follows:

   A. Packing

   - Wrap the Sensor Transmitter in a plastic bag first.
   - Pack in original shipping carton or a sturdy oversized carton.
   - Use plenty of packing material.

   B. Include:

   - A brief description of the problem with all known symptoms.
   - Your telephone number.
   - Your return street shipping address (UPS will not deliver to a P.O. box).
   - Write the RMA number on the outside of the box.

   C. Shipping

   - Send freight prepaid (UPS recommended).
   - Insurance is recommended. (The factory can provide the current replacement value of the item being shipped for insurance purposes.)

   D. Send to:

      Columbia Weather Systems, Inc.
      5285 NE Elam Young Parkway, Suite C100
      Hillsboro, Oregon 97124

   E. C.O.D. shipments will not be accepted.

3. If your unit is under warranty, after repair or replacement has been completed, it will be returned by a carrier and method

chosen by Columbia Weather, Inc. to any destination within the continental U.S.A. If you desire some other specific form of conveyance or if you are located beyond these borders, then you must bear the additional cost of return shipment.

4. If your unit is not under warranty, we will call you with an estimate of the charges. If approved, your repaired unit will be returned after all charges, including parts, labor and return shipping and handling, have been paid. If not approved, your unit will be returned as is via UPS COD for the amount of the UPS COD freight charges.

Reference

Glossary

Aspirating Radiation Shield

A device used to shield a sensor such as a temperature probe from direct and indirect radiation and rain while providing access for ventilation.

Barometric Pressure

The pressure exerted by the atmosphere as a consequence of gravitational attraction exerted upon the “column” of air lying directly above the point in question.

Celsius Temperature Scale

A temperature scale with the ice point at 0 degrees and the boiling point of water at 100 degrees.

Dew Point

The temperature to which a given parcel of air must be cooled at constant pressure and constant water-vapor content in order for saturation to occur. When this temperature is below 0°C, it is sometimes called the frost point.

Fahrenheit Temperature Scale

A temperature scale with the ice point at 32 degrees and the boiling point of water at 212 degrees.

Heat Index

The heat index or apparent temperature is a measure of discomfort due to the combination of heat and high humidity. It was developed in 1979 and is based on studies of evaporative skin cooling for combinations of temperature and humidity.

Relative Humidity

Popularly called humidity. The ratio of the actual vapor pressure of the air to the saturation vapor pressure.

Sea Level Pressure

The atmospheric pressure at mean sea level, either directly measured or, most commonly, empirically determined from the observed station pressure.

In regions where the earth's surface pressure is above sea level, it is standard observational practice to reduce the observed surface pressure to the value that would exist at a point at sea level directly below.

Wind Chill

That part of the total cooling of a body caused by air motion.

Unit Conversion

Speed

Kilometers per hour = 1.610 x miles per hour

Knots = 0.869 x miles per hour

Meters per second = 0.448 x miles per hour

Feet per second = 1.467 x miles per hour

Temperature

Temperature in °C = 5/9 (temperature in °F - 32)

Temperature in °F = (1.8 x temperature in °C) + 32

Distance

Millimeters = 25.4 x inches

Pressure

Millibars = 33.86 x inches of mercury

Kilopascals = 3.386 x inches of mercury

Pounds per square inch = 0.49 x inches of mercury

Standard atmospheres = 0.0334 x inches of mercury

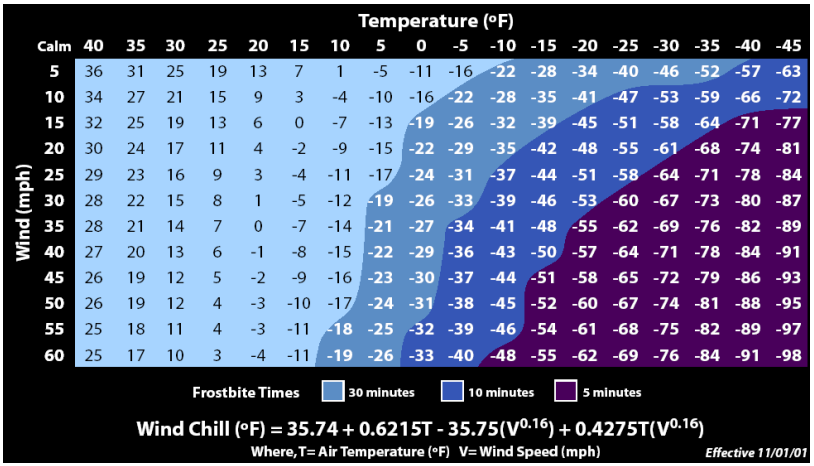
Tables and Formulas

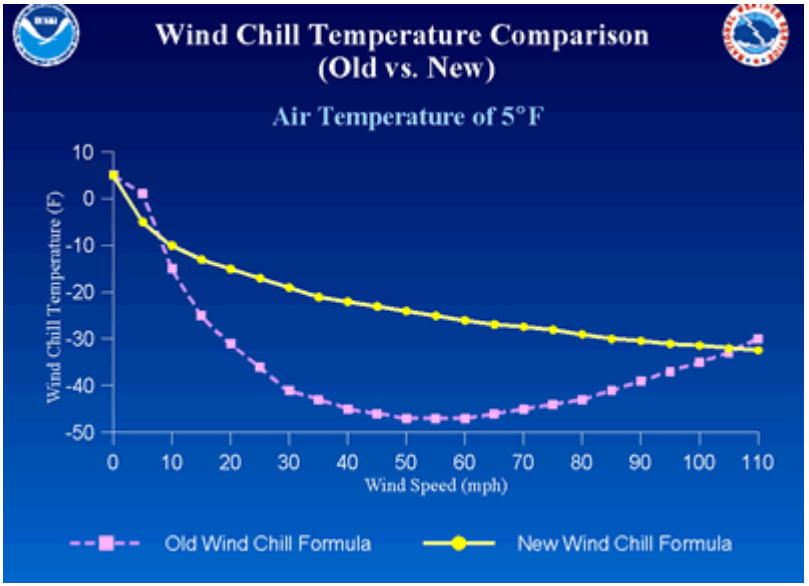
Wind Chill Chart

In 2001, NWS implemented an updated Wind chill Temperature (WCT) index. The change improves upon the former WCT Index used by the NWS and the Meteorological Services of Canada, which was based on the 1945 Siple and Passel Index.

In the fall of 2000, the Office of the Federal Coordinator for Meteorological Services and Supporting Research (OFCM) formed a group consisting of several Federal agencies, MSC, the academic community (Indiana University-Purdue University in Indianapolis (IUPUI), University of Delaware and University of Missouri), and the International Society of Biometeorology to evaluate and improve the windchill formula. The group, chaired by the NWS, is called the Joint Action Group for temperature Indices (JAG/TI). JAG/TI's goal is to upgrade and standardize the index for temperature extremes internationally (e.g. Wind chill Index).

The current formula uses advances in science, technology, and computer modeling to provide a more accurate, understandable, and useful formula for calculating the dangers from winter winds and freezing temperatures.





Wind Chill Equation

$WC = 35.74 + 0.6215\ T - 35.75(V^{0.16}) + 0.4275\ T(V^{0.16})$

Where:

WC = wind chill temperature in °F

V = wind velocity in mph

T = air temperature in °F

Note: *Wind chill Temperature is only defined for temperatures at or below 50 degrees F and wind speeds above 3 mph.*

Heat Index

RH	Temperature in °F													
	70	75	80	85	90	95	100	105	110	115	120	125	130	135
0	64	66	73	78	83	87	91	95	99	103	107	111	117	120
5	64	69	74	79	84	88	93	97	102	107	111	116	122	126
10	65	70	75	80	85	90	95	100	105	111	116	123	131	
15	65	71	76	81	86	91	97	102	108	115	123	131		
20	66	72	77	82	87	93	99	105	112	120	130	141		
25	66	72	77	83	88	94	101	109	117	127	139			
30	67	73	78	84	90	96	104	113	123	135	148			
35	67	73	79	85	91	98	107	118	130	143				
40	68	74	79	86	93	101	110	123	137	151				
45	68	74	80	87	95	104	115	129	143					
50	69	75	81	88	96	107	120	135	150					
55	69	75	81	89	98	110	126	142						
60	70	76	82	90	100	114	132	149						
65	70	76	83	91	102	119	138							
70	70	77	84	93	106	124	144							
75	70	77	85	95	109	130	150							
80	71	78	86	97	113	136								
85	71	78	87	99	117	140								
90	71	79	88	102	122	150								
95	71	79	89	105	126									
100	72	80	90	108	131									

Dew Point

B = (ln (RH/100) + ((17.2694*T) / (238.3+T))) / 17.2694

Dew Point in ℃ = (238.3 * B) / (1-B)

Where:

RH = Relative Humidity

T = Temperature in ℃

Ln = Natural logarithm

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